

# CANINE C-REACTIVE PROTEIN

Immunoperoxidase Assay for Determination of C - REACTIVE PROTEIN in Dog Sera

## DIRECTIONS FOR USE

Version L 4.3

### INTENDED USE

The CRP test kits are a highly sensitive two-site enzyme linked immunoassay (ELISA) for measuring CRP in serum or plasma of dogs.

### INTRODUCTION

Acute phase proteins are plasma proteins which increase in concentration following infection, inflammation or trauma. The first acute phase protein to be recognized was discovered in humans by Tillet and Frances in 1930<sup>1</sup>. This C-reactive protein (CRP) is so named because it is able to effect precipitation of somatic C-polysaccharide of *Streptococcus pneumoniae*. CRP is an alpha globulin with a mass of 110,000 to 140,000 daltons, and composed of five identical subunits, which are non-covalently assembled as a cyclic pentamer. It is synthesized in the liver and, in humans, is normally present as a trace constituent of serum at levels less than 0.3 mg/dL. The levels in serum rise quickly following acute tissue damage and also falls very rapidly once the stimulus is removed. It has been proposed that the function of CRP is to aid in complement activation, influence phagocytic cell function, and augment cell mediated cytotoxicity. Investigations over the past few years have shown that quantification of these in plasma or serum can provide valuable diagnostic information in the detection, prognosis, and monitoring of disease not only in humans, but in companion animals and farm herds as well<sup>2</sup>.

### PRINCIPLE OF THE ASSAY

The principle of the double antibody sandwich ELISA is represented in Figure 1. In this assay the CRP present in serum sample reacts with the anti-CRP antibodies which have been adsorbed to the surface of polystyrene microtitre wells. After the removal of unbound serum proteins by washing, anti-CRP antibodies conjugated with horseradish peroxidase (HRP), are added. These enzyme-labeled antibodies form complexes with the previously

bound serum CRP. Following another washing step, the enzyme bound to the immunosorbent is assayed by the addition of a chromogenic substrate, 3,3',5,5'-tetramethylbenzidine (TMB). The quantity of bound enzyme varies directly with the concentration of CRP in the sample tested; thus, the absorbance, at 450 nm, is a measure of the concentration of CRP in the test sample. The quantity of CRP in the test sample can be interpolated from the standard curve constructed from the standards, and corrected for serum dilution.

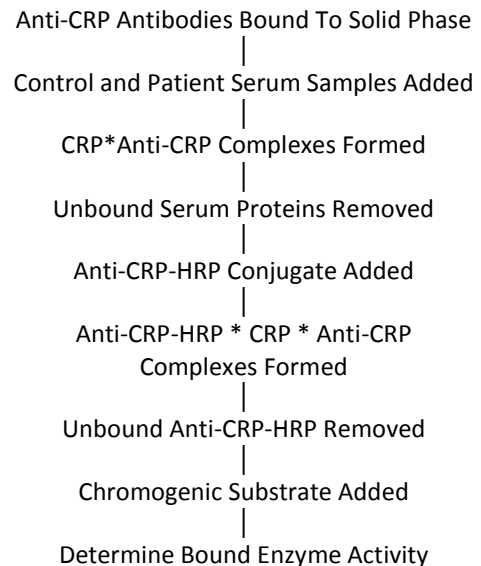


Figure 1.

### REAGENTS

(Quantities sufficient for 96 determinations)

#### 1. DILUENT CONCENTRATE

One bottle containing 50 ml of a 5X concentrated phosphate buffered saline (PBS) solution containing bovine serum albumin, 0.25% Tween, and 0.25% Proclin 300 as a preservative.

## 2. WASH SOLUTION CONCENTRATE

One bottle containing 50 ml of a 20X concentrated phosphate buffered saline (PBS) solution containing 1% Tween.

## 3. ENZYME-ANTIBODY CONJUGATE

One vial containing 200 µL of affinity purified anti-Canine CRP antibody conjugated with horseradish peroxidase in a stabilizing buffer.

## 4. CHROMOGEN-SUBSTRATE SOLUTION

One vial containing 12 mL of 3,3',5,5'-tetramethylbenzidine (TMB) and hydrogen peroxide in citric acid buffer at pH 3.3.

## 5. STOP SOLUTION

One vial containing 12 ml 0.3 M sulfuric acid.

**WARNING: Avoid contact with skin.**

## 6. ANTI-CANINE CRP ELISA MICRO PLATE

Twelve removable eight (8) well micro well strips in well holder frame. Each well is coated with affinity purified anti-Canine CRP.

## 7. CANINE CRP CALIBRATOR

One vial containing a lyophilized Canine CRP calibrator.

### **FOR IN VITRO USE ONLY**

### **REAGENT PREPARATION**

#### 1. DILUENT

The Diluent Solution supplied is a 5X Concentrate and must be diluted 1:5 with distilled or deionized water.

#### 2. WASH SOLUTION CONCENTRATE

The Wash Solution supplied is a 20X Concentrate and must be diluted 1:20 with distilled or deionized water. Crystal formation in the concentrate is not uncommon when storage temperatures are low. Warming of the concentrate to 30-35°C before dilution can dissolve crystals.

#### 3. ENZYME-ANTIBODY CONJUGATE

The required amount of working conjugate solution for each microtitre plate is prepared by adding 100 µL Enzyme-Antibody Conjugate to 10 mL of Diluent. Mix uniformly, but gently. Avoid foaming.

#### 4. CHROMOGEN-SUBSTRATE SOLUTION

Ready to use as supplied.

#### 5. STOP SOLUTION

Ready to use as supplied.

#### 6. ANTI-CANINE CRP ELISA MICRO PLATE

Ready to use as supplied.

#### 7. CANINE CRP STANDARDS

Add 1.0 ml of distilled or de-ionized water to the Canine CRP Calibrator and mix gently until dissolved. The calibrator is now at a concentration of 540 ng/ml (**the reconstituted calibrator should be aliquoted and frozen if future use is intended**). Canine CRP standards need to be prepared immediately prior to use (see chart below). Mix well between each step. Avoid foaming.

Standard	ng/ml	Volume added to 1x Diluent	Volume of 1x Diluent
1	200	200 µl Canine CRP Calibrator	340 µl
2	100	250 µl standard 1	250 µl
3	50	250 µl standard 2	250 µl
4	25	250 µl standard 3	250 µl
5	12.5	250 µl standard 4	250 µl
6	6.25	250 µl standard 5	250 µl
7	3.125	250 µl standard 6	250 µl

### **STORAGE AND STABILITY**

The expiration date for the package is stated on the box label.

#### 1. DILUENT

The 5X Diluent Concentrate is stable until the expiration date. The 1X working solution is stable for at least one week from the date of preparation. Both solutions should be stored at 4-8°C.

#### 2. WASH SOLUTION

The 20X Wash Solution Concentrate is stable until the expiration date. The 1X working solution is stable for at least one week from the date of preparation. Both solutions can be stored at room temperature (16-25°C) or at 4-8°C.

#### 3. ENZYME-ANTIBODY CONJUGATE

Undiluted horseradish peroxidase anti-CRP conjugate should be stored at 4-8°C and diluted immediately prior to use. The working conjugate solution is stable for one day.

#### 4. CHROMOGEN-SUBSTRATE SOLUTION

The Substrate Solution should be stored at 4-8°C and is stable until the expiration date.

## 5. STOP SOLUTION

The Stop Solution should be stored at 4-8°C and is stable until the expiration date.

## 6. ANTI-CANINE CRP ELISA MICRO PLATE

Anti-Canine CRP coated wells are stable until the expiration date, and should be stored at 4-8°C in the sealed foil pouch with desiccant pack.

## 7. CANINE CRP CALIBRATOR/STANDARDS

**The lyophilized Canine CRP Calibrator should be stored at 4C or frozen until reconstituted. The reconstituted calibrator should be aliquoted and stored frozen (avoid multiple freeze-thaw cycles).** The working standard solutions should be prepared immediately prior to use and are stable for 1 day.

## INDICATIONS OF INSTABILITY

If the test is performing correctly, the results observed with the standard solutions should be within 20 % of the expected values.

## SPECIMEN COLLECTION AND HANDLING

Blood should be collected by venipuncture and the serum separated from the cells, after clot formation, by centrifugation. Specimens may be shipped at room temperature and then stored refrigerated at 2-8°C if testing is to take place within one week after collection. If testing is to take place later than one week, specimens should be stored at -20°C. Avoid repeated freeze-thaw cycles.

### 1. Precautions

For any sample that might contain pathogens, care must be taken to prevent contact with open wounds.

### 2. Additives and Preservatives

No additives or preservatives are necessary to maintain the integrity of the specimen. Avoid azide contamination.

### 3. Known interfering substances

Azide and thimerosal at concentrations higher than 0.1% inhibits the enzyme reaction.

## MATERIAL PROVIDED

See "REAGENTS"

## MATERIALS REQUIRED BUT NOT PROVIDED

- Precision pipette (2 µL to 200µL) for making and dispensing dilutions
- Test tubes
- Microtitre washer/aspirator
- Distilled or Deionized H<sub>2</sub>O
- Microtitre Plate reader
- Assorted glassware for the preparation of reagents and buffer solutions
- Timer
- Vortex mixer

## ASSAY PROTOCOL

### DILUTION OF SERUM SAMPLES

The assay for quantification of CRP in serum requires that each test sample be diluted before use. For a single step determination a dilution of serum at 1:1000 is appropriate for most samples. **For absolute quantification, samples that yield results outside the range of the standard curve, a lesser or greater dilution might be required.**

1. To prepare a 1:1,000 dilution of sample, transfer 5 µL of sample to 245 µL of diluent. This gives you a 1:50 dilution. Next, dilute the 1:50 sample by transferring 20 µL, to 380 µL of diluent. You now have a 1:1,000 dilution of your sample. Mix thoroughly at each stage.

## PROCEDURE

Bring all reagents to room temperature before use.

1. Add 100 µL of Diluent to each of the wells in 1A & 2A. These will serve for an evaluation of the background associated with the assay.
2. Pipette 100 µL of
  - Standard 1 (200 ng/ml) into wells 1B & 2B
  - Standard 2 (100 ng/ml) into wells 1C & 2C
  - Standard 3 (50 ng/ml) into wells 1D & 2D
  - Standard 4 (25 ng/ml) into wells 1E & 2E
  - Standard 5 (12.5 ng/ml) into wells 1F & 2F
  - Standard 6 (6.25 ng/ml) into wells 1G & 2G
  - Standard 7 (3.125 ng/ml) into wells 1H & 2H
3. Pipette 100 µL of diluted serum sample (test sample 1) into wells 3A & 4A. The next sample goes in wells 3B & 4B, the next in 3C & 4C and so on.
4. Incubate the micro titer plate at 22°C (room temperature) for ten (10 ± 2) minutes. Keep plate level during incubation.
5. Following incubation, aspirate the contents of the wells.

6. Completely fill each well with appropriately diluted Wash Solution and aspirate. Repeat three times, for a total of four washes. If washing manually: completely fill wells with wash buffer, invert the plate then pour/shake out the contents in a waste container. Follow this by sharply striking the wells on absorbent paper to remove residual buffer. Repeat 3 times for a total of four washes.

7. Pipette 100  $\mu$ L of appropriately diluted Enzyme-Antibody Conjugate to each well. Incubate in dark at 22°C (room temperature) for ten ( $10 \pm 2$ ) minutes.

8. Wash and blot the wells as described in Step 5/6.

9. Pipette 100  $\mu$ L of TMB Substrate Solution into each well.

10. Incubate in dark at room temperature for precisely five (5) minutes.

11. After five minutes, add 100  $\mu$ L of Stop Solution to each well.

12. Determine the absorbance (450 nm) of the contents of each well. Calibrate the plate reader to air.

#### **STABILITY OF THE FINAL REACTION MIXTURE**

The absorbance of the final reaction mixture can be measured up to 2 hours after the addition of the Stop Solution. However, good laboratory practice dictates that the measurement be made as soon as possible.

#### **RESULTS**

1. Subtract the average background value from the test values for each sample.

2. Using the results observed for the standards construct a Standard Curve. The appropriate curve fit is that of a four-parameter logistics curve. A second order

polynomial (quadratic) or other curve fits may also be used.

3. Interpolate test sample values from standard curve. Correct for sera dilution factor to arrive at CRP concentration is original sample.

#### **QUALITY CONTROL**

In accord with good laboratory practice, the Assays for specific CRP require meticulous quality control. Each laboratory should use routine quality control procedures to establish inter- and intra-assay precision and performance characteristics.

#### **LIMITATION OF THE PROCEDURE**

1. Reliable and reproducible results will be obtained when the assay procedure is carried out with a complete understanding of the information contained in the package insert instructions and with adherence to good laboratory practice.

2. Factors that might affect the performance of the assay include proper instrument function, cleanliness of glassware, quality of distilled or de-ionized water, and accuracy of reagent and sample pipetting.

#### **REFERENCES**

1. Tillett, W.S. and T. Francis. 1930. Serological reactions in pneumonia with non-protein somatic fraction of pneumococcus. J. Exp Med. 52:561-571.

2. Eckersal, P.D. 2000. Recent advances and future prospects for the use of acute phase proteins and markers of disease in animals. Revue Med. Vet. 151(7): 577-584.